Project Introduction

To address the NASA LaRC need for innovative methods and tools for the diagnosis of aircraft faults and failures, Physical Optics Corporation (POC) proposes to develop a new Active Integrated Diagnosis with Ensembles (AIDE) system, based on Bayesian network modeling, ensemble learning, and context-aware reasoning. This approach incorporates an active fault diagnosis system architecture, a block-level Bayesian-network-based context model, and a context-aware reasoning and severity assessment engine, which enable us to meet NASA aviation safety mission requirements for reliable and accurate diagnosis and assessment of adverse events with minimal uncertainty. The system offers constantly updated aircraft health context, which guides the active queries on aircraft health management systems to minimize the uncertainty along its progress path in the context model and make statistical inference and diagnosis, providing rank-ordered lists of diagnoses, severity assessments, and uncertainty measurements. In Phase I, POC will demonstrate the feasibility of active diagnosis of aircraft faults and failures by establishing context models and building and testing a preliminary prototype, which will demonstrate TRL-2 by the end of Phase I. Integration and validation issues will be explored through communication and collaboration with manufacturers. In Phase II, POC plans to develop a fully functional prototype, including software and supporting hardware, and demonstrate its fault diagnosis capability on a family of adverse events in the AirSTAR testbed. The results demonstrated will offer NASA the capabilities to diagnose and assess adverse events and improve aviation safety.

Primary U.S. Work Locations and Key Partners

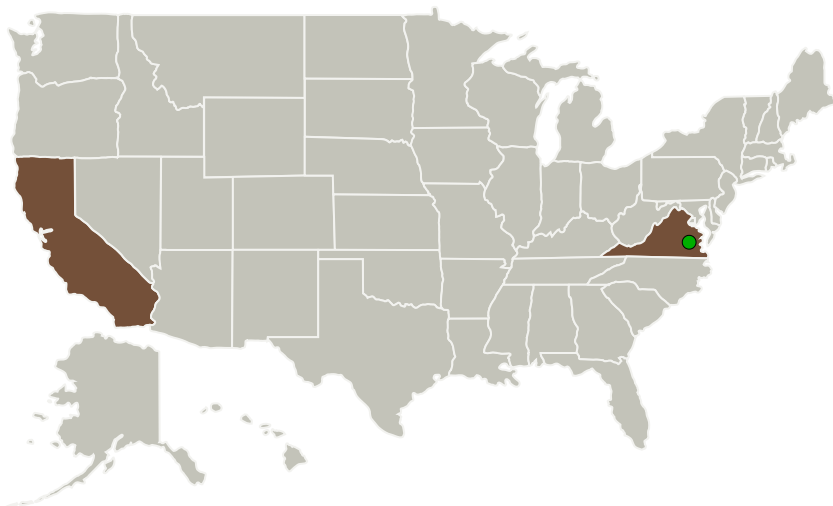Active Fault Diagnosis and Assessment for Aircraft Health Management, Phase I

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Active Fault Diagnosis and Assessment for Aircraft Health Management, Phase I

Completed Technology Project (2011 - 2011)

Organizations Performing Work	Role	Type	Location
Physical Optics Corporation	Lead Organization	Industry	Torrance, California
🟢Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Transitions

▶ **February 2011:** Project Start

✔ **September 2011:** Closed out

Closeout Documentation:
- Final Summary Chart*(https://techport.nasa.gov/file/137945)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Physical Optics Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management
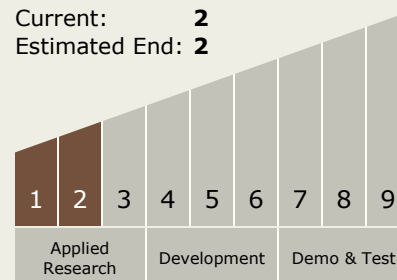
Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Wenjian Wang

Technology Maturity (TRL)

Start: **1**
Current: **2**
Estimated End: **2**

1	2	3	4	5	6	7	8	9
Applied Research			Development			Demo & Test		

Technology Areas

Primary:

- TX10 Autonomous Systems
  └ TX10.2 Reasoning and Acting
    └ TX10.2.5 Fault Diagnosis and Prognosis

Target Destinations

Earth, The Moon, Others Inside the Solar System, Outside the Solar System, The Sun, Mars